Chapter Eight: Cultural Impacts on Pond Water Quality

Heavy public use of many kettle pond shorelines has caused soil erosion and sediment deposition. This has added to the current decline in pond water quality caused by the addition of phosphorus from wastewater. Disturbed soils which erode into pond waters may increase the nutrient loading problem by carrying nutrients from non-point pollution sources. Every pond used for recreation, such as swimming and fishing, is experiencing sediment deposition due to erosion of roads, trails, and shorelines. Many of the ponds are accessible by car, making them a target for heavy use. In addition to problems of erosion, stream channelization to improve anadromous fish access is another pond management issue that has come into controversy in past years. The effects of the anadromous herring run on Gull Pond are unknown, as are the effects of allowing the Gull-Higgins ponds sluiceway to naturally close by deposition of sand.

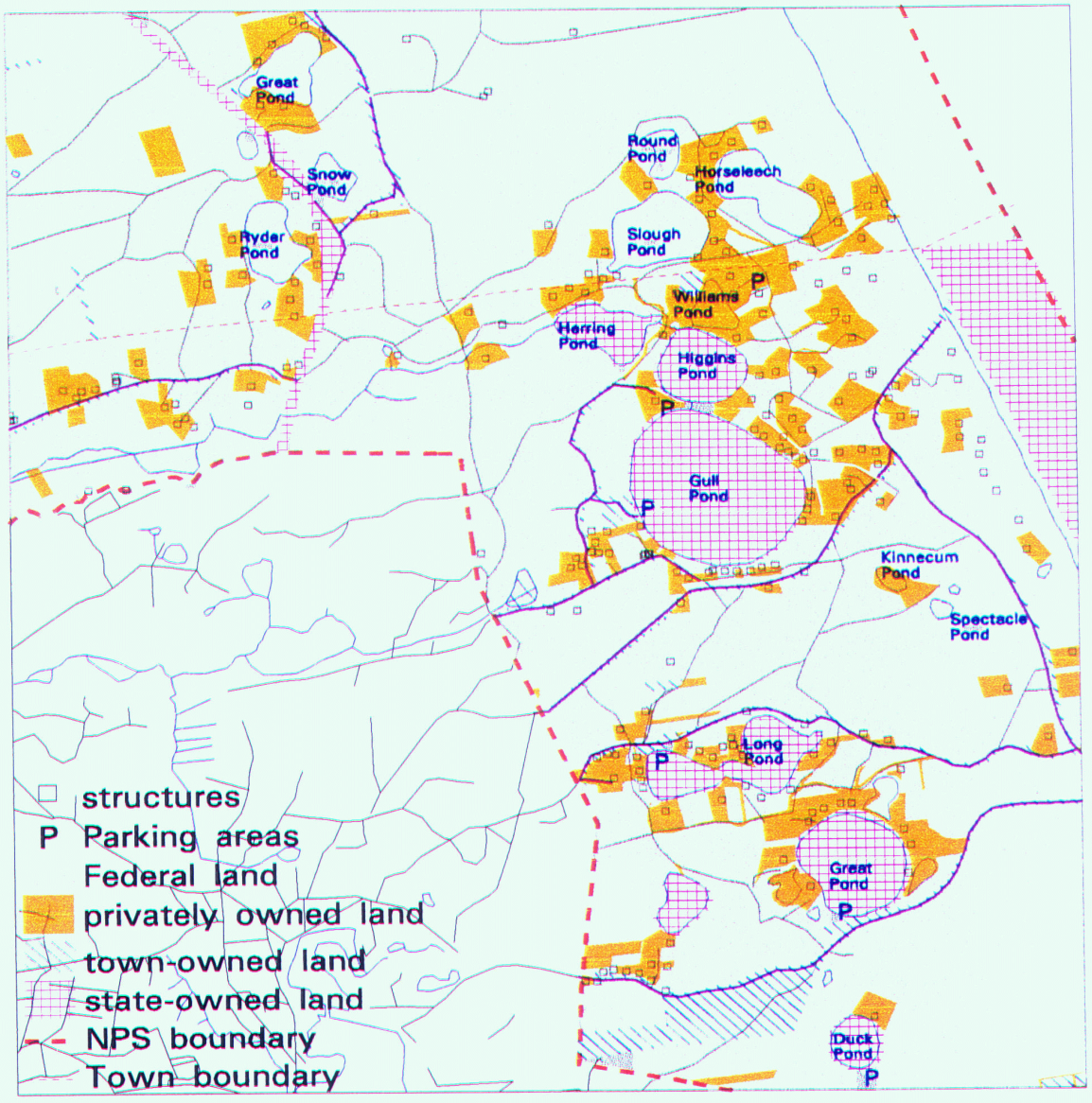
Problem History

In most cases, revegetation is the most practical method of mitigating problems of heavy soil erosion around pond shorelines. However, the 20 kettle ponds within the National Seashore suffer from impacts related to multi-jurisdictional ownership and access which cannot be mitigated completely by revegetation. The area that surrounds the kettle ponds contains roads and access points that are maintained by both the National Park Service and local communities, as well as ones that have been informally created by persons seeking alternative access to remote portions of the ponds. Many of the ponds located within Wellfleet have shoreline ownership that is divided between the federal government, private landowners, and the state, which possesses titles to the pond beds (Figure 8.1). Duck Pond is one example of a pond that has several different ownerships and has many management concerns as a result. Duck Pond is accessible by a town owned parking area (Figure 8.2). Adjacent to this parking area is a power line clearing that accommodates additional parking during the peak season. Lack of signs or fencing to deter parking along the power line increases public use on Duck Pond and threatens to significantly change its ecological character. Situations such as this are challenging and finding a remedy may be difficult as many landowners and government interests are represented in a small area. The health of the 20 kettle ponds is dependent on careful planning and cooperative management between the National Seashore natural resource staff, pond shoreline residents, local and state government agencies, and the public.

Water Resources Management Plan

Figure 8.1: Shoreline Ownership Patterns Wellfleet/Truro Kettle Ponds

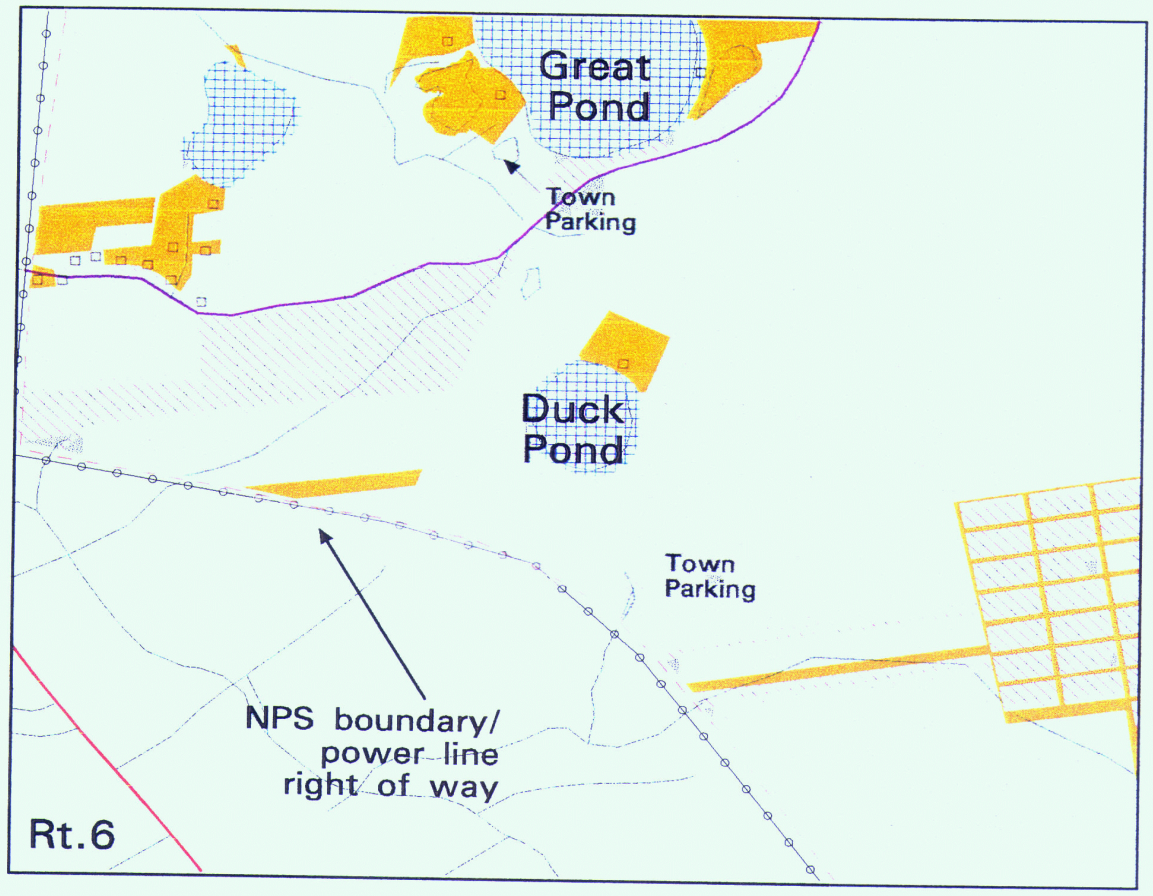
Source: ownership from Federal lands records.



Water Resources Management Plan

Figure 8.2: Multi-Jurisdictional Land Ownership Near Duck Pond Cape Cod National Seashore

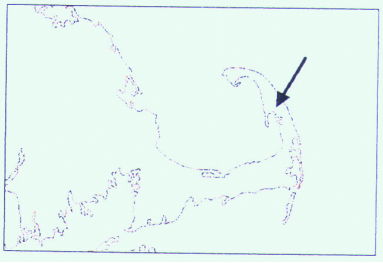
Sources: Ownership from Federal lands records.



Federal land
privately owned land
town-owned land
state-owned land
NPS boundary
power line right-of-way
structures

N

Scale 1:15000



The Challenge

Design and implement a cooperative management program for the 20 kettle ponds that sustains the resource. Consider access issues and relate recreational use to water quality. Mitigate recreational impacts.

Complexities of Ownership

Jurisdiction and management of the 20 kettle ponds is dependent on two factors: who owns rights to the pond, and who owns access points to the pond. All ponds greater than 10 acres are *great ponds* as established by the Colonial Ordinance of 1641 and amended in 1647. This law, as it remains today, grants the title to the bed (i.e., submerged land) of a great pond to the Commonwealth of Massachusetts. The state has the right to control and regulate the use of great ponds and can limit their use under certain circumstances. Additionally, the state has the right to convey the title of a great pond to the National Park Service. Title to bed, but not the water, has been transferred to the National Park Service for National Seashore ponds in Truro and Provincetown. The State of Massachusetts continues to hold the titles to ponds in Wellfleet. The state can also delegate regulatory authority to local towns by Mass. G.L. Chapter II, Section 45. This agreement has made it possible for Truro and Wellfleet to enact rules and regulations concerning pond activities that are enforceable by local police. The public has the right to access any great pond, and where no access exists, the public may cross, by foot, private property which is not "improved, enclosed or cultivated." Ownership of the shoreline on a great pond conveys no special authority over or ownership of the pond itself; landowners have the same rights of use as the general public.

When a pond is less than 10 acres and private residences occupy the shoreline, the title to the pond bed is divided among the shoreline owners. Ownership of the pond bed runs from the property lines on the shore to the center of the pond, creating a wedge-shaped piece of property for private landowners. Shoreline owners have the authority to regulate public access to their land or to close their section of the shore to the public completely.

National Park Service Management Zoning

The General Management Plan (National Park Service, 1998) places ponds in the natural management zone. According to the plan, the natural zone "includes most of the National Seashore where the primary experience is one of being in natural surroundings, such as woods or along the beach." The natural zone is broken down into four management subzones, three of which apply specifically to ponds: Concentrated Use, Dispersed Use, and Low Use. Ponds with well developed public access are in the Concentrated Use subzone. These areas are easily accessible to the public by hardened trails or boardwalks and have parking areas provided. Examples are Snow Pond and Duck Pond. Dispersed Use refers to more remote areas which have no public facilities or improvements. Vehicles are permitted only in designated corridors and along ungated sand roads. Low Use refers to remote natural areas where a person can expect to be completely immersed in a natural landscape and where tranquility and freedom from settlements or people is highly likely. These management subzones allow the

National Park Service to modify or enhance existing access to any of the ponds.

Natural resource problems created by multi-jurisdictional management of the 20 kettle ponds are complex and difficult to resolve using pond by pond solutions because access restriction to one pond may cause increased use, and subsequent overuse, of another. By managing the ponds as a single recreational and natural resource, all those with vested interests would have the ability to manage the pond system in a way that is best for the system as a whole. Currently, no comprehensive plan for the ponds exists. Several plans for individual ponds have been started and never completed (Martin et al., 1992). A plan that covers soil erosion on pond shorelines as well as shoreline septic systems (see Chapter Six) and addresses the various interests of each management partner would serve all interests in the future.

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Gull Pond Sluiceway

During the 1800s, residents of Wellfleet dug and stabilized an artificial sluiceway between Gull and Higgins ponds (Figure 8.3). The sluiceway was maintained in order to provide herring with additional spawning waters in Gull Pond, thus improving the anadromous fish run that exists in the Herring River. Since the establishment of the National Seashore, the National Park Service has maintained the sluiceway by periodic dredging. This practice has been taken over by local volunteers working under the direction of the Massachusetts Herring Run Protection Program. Gull Pond is also used as a trout fishery. The fishery is managed by the Commonwealth of Massachusetts, Division of Fisheries and Wildlife under the terms of a Memorandum of Understanding with the National Park Service (December 20, 1968). This agreement recognizes that the management of fish and wildlife must be cooperative between the State of Massachusetts and the National Park Service (Mitchell and Soukup, 1981).

Whether or not to maintain the historical sluiceway between Gull and Higgins ponds is a complex question with potential impacts on the natural biota of the ponds, the introduced trout fishery, and the anadromous herring run in the Herring River. Without the sluiceway, the two species of herring, alewife and blue-backed herring, would no longer be able to enter Gull Pond to spawn in the spring, and the juveniles would be unable to leave the pond in late summer and fall.

The sluiceway has traditionally been maintained by the National Park Service for two basic reasons. The first is for protection of the herring and their habitat. The second is because little is known about what effect allowing the sluiceway to fill in will have on Gull Pond (M. Reynolds, 1996, pers. comm., National Park Service). While the sluiceway remains a part of the cultural landscape of

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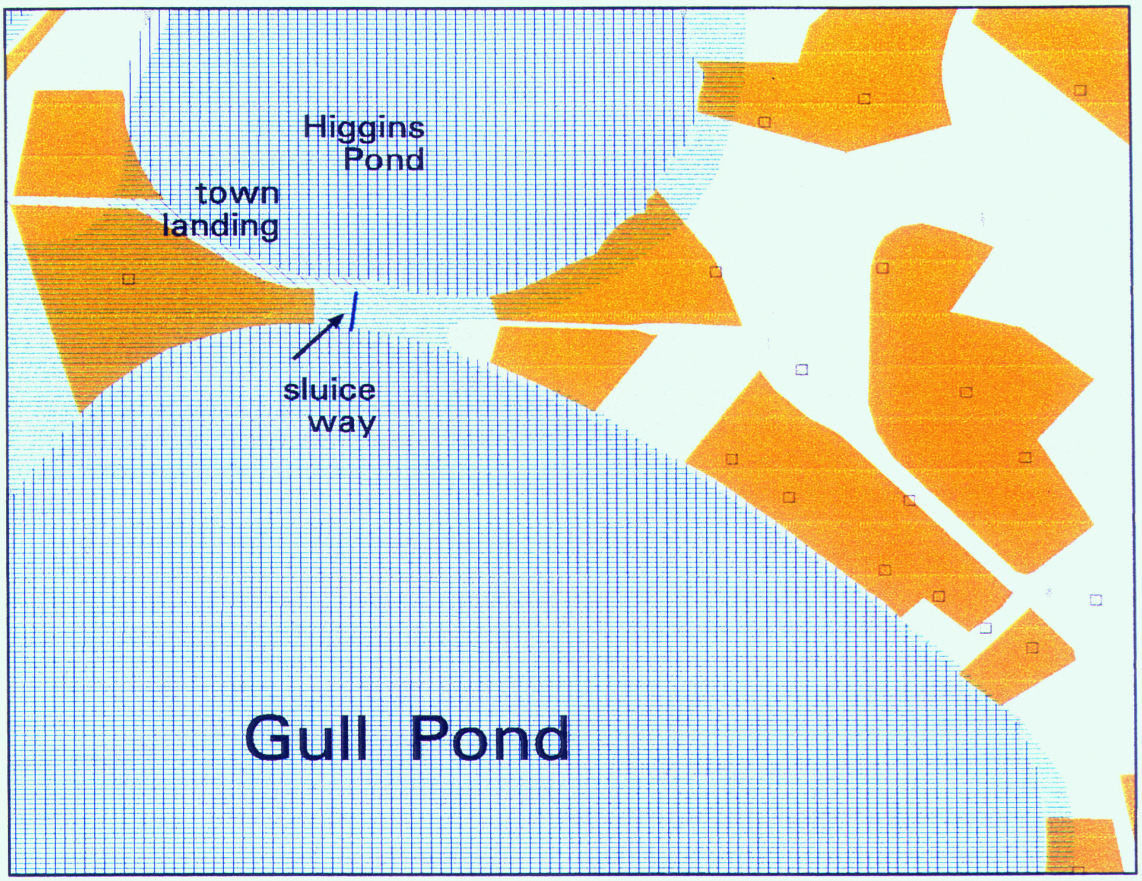
Figure 8.3: Gull Pond Sluiceway
Cape Cod National Seashore

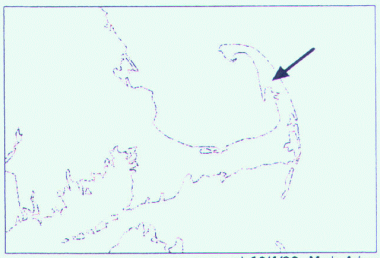
Sources: Ownership from Federal lands records.



Federal land
privately owned land
state-owned land
flood zone (from FEMA)
structures

N

Scale 1:5000



map prepared 12/4/96, Mark Adams

Cape Cod, a National Seashore natural resource management objective (National Park Service, 1996a) contradicts the current preservation efforts. The objective states, " (management should) allow natural processes to continue unimpeded in natural zones, including the action of wind and water, and neutralize the effects of human intervention where it has adversely affected natural systems."

Whether or not to maintain the historical sluiceway between Gull and Higgins ponds is a complex question with potential impacts on the natural biota of the ponds, the introduced trout fishery, and the anadromous herring run in the Herring River.

The influx of herring into relatively small freshwater systems may have a considerable impact upon pre-established food chains and nutrient cycles. Adult fish may remain from a few days to many weeks on the spawning grounds; mortality of adult fish on the spawning grounds is high, 39 to 57 percent (Durbin et al., 1979). Young alewives spend part or all of their first summer in the nursery area and then migrate to sea. Since most of their growth and nutrient uptake occurs at sea, these fish may represent a nutrient source to ponds (through shedding eggs and sperm, excretions, and the carcasses of the dead spawners). In ground water fed lakes, which do not have large amounts of water flowing in and out, such nutrient additions may be significant (Mitchell and Soukup, 1981).

The introduction of alewives can also change the aquatic community of plants and animals. Alewives eat zooplankton. Zooplankton, such as *Daphnia* spp., are herbivores and feed on algae in lakes and ponds and thus reduce algal concentrations. When planktivores, such as the alewife, are introduced to a pond, the populations of zooplankton may decrease significantly and the populations of algae increase with the reduced grazing pressure (Shapiro, 1990). Based on this occurrence, which has been observed in several locations including Lake Michigan (Shapiro, 1990), Gull Pond would hypothetically see a decrease in algal growth after the sluiceway is closed and alewives are prevented from entering. This algal density may be one factor in the relatively low clarity observed in Gull Pond. Reduced clarity may, in turn, contribute to the dissolved oxygen deficit observed at the bottom of Gull Pond by reducing the level of light penetration at these depths. Additionally, the subsequent increase in deposition of organic matter reduces dissolved oxygen. This change may eventually affect the trout fishery in Gull Pond (Mitchell and Soukup, 1981).

Current Monitoring and Mitigation

Annual Pond Monitoring Program

The National Park Service recognizes the need for a comprehensive, systematic, and intensive pond monitoring protocol that will enable the park staff to detect important limnological changes associated with human activities. A program of pond monitoring was established (Martin et al., 1992). Monitoring objectives include: 1) characterize the trophic status of the ponds; 2) recommend and implement methods of monitoring trophic status and limnological processes to detect important changes; 3) describe pond-specific and seasonal in-lake and hydrological processes affecting water quality; and, 4) identify and design management actions to mitigate anthropogenic effects.

Management Steps: Recreational Impacts to Pond Water Quality
400 Days to 5 Years

Committee

Address the current problems and obstacles related to managing the 20 kettle ponds. Consider cooperative management solutions that benefit the natural environment as well as parties involved.

Education

Place signs near ponds that have a significant sensitivity to recreational use. Explain the importance of hiking on designated trails and remaining in designated recreation areas.

Data Management

Gather a detailed information base that comprehensively illustrates ownership complexities in and around each cluster of ponds. Place this information on maps and use them as a tool in the management process.

Research

Examine the solutions that other parks have utilized in resolving multi-jurisdictional ownership problems related to the use of a natural resource for recreation. Examine the 20 ponds as a single unit, concentrating on access points and alternatives to access that would ease impacts to the ponds themselves. Conduct a survey of current and old on-site wastewater treatment systems within 25 feet (100 m) of pond shorelines. Identify the location and depth relative to the water table. Identify problems specific to any systems.